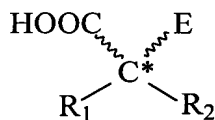


WHAT IS CLAIMED IS:

1. A method for producing an enantiomerically pure α -substituted carboxylic acid, said method comprising contacting an aldehyde or ketone with a cyanide containing compound and an ammonia-containing compound or an ammonium salt or an amine, and stereoselectively hydrolyzing the resulting amino nitrile or cyanohydrin intermediate with a nitrilase or a polypeptide having nitrilase activity, wherein the nitrilase is sufficiently active to perform the hydrolysis in the presence of the reaction components, under conditions and for a time sufficient to produce the carboxylic acid.

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2. The method according to claim 1, wherein said enantiomerically pure α -substituted carboxylic acid has the following structure:



wherein:

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R_1 and R_2 are each independently -H, substituted or unsubstituted alkyl, alkenyl, alkynyl, aryl, heteroaryl, cycloalkyl, heterocyclic, wherein said substituents are lower alkyl, hydroxy, alkoxy, mercapto, cycloalkyl, heterocyclic, aryl, heteroaryl, aryloxy, or halogen or optionally R_1 and R_2 are linked to cooperate to form a functional cyclic moiety and

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E is $-\text{N}(\text{R}_x)_2$ or $-\text{OH}$, wherein each R_x is -H or lower alkyl.

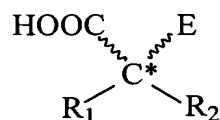
3. The method according to claim 2, wherein said enantiomerically pure α -substituted carboxylic acid is an α -amino acid.
4. The method according to claim 3, wherein at least one of R_1 and R_2 is substituted or unsubstituted aryl.
5. The method according to claim 4, wherein said enantiomerically pure α -amino acid is D-phenylalanine, D-phenylglycine, or L-methylphenylglycine.

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18. An enantiomerically pure α -substituted carboxylic acid produced by a process comprising combining an aldehyde or ketone with a metal cyanide, ammonia or an ammonium salt, and a nitrilase, under conditions and for a time sufficient to produce the carboxylic acid.

19. The enantiomerically pure α -substituted carboxylic acid according to claim 18, having the structure:



- wherein:

R_1 and R_2 are each independently -H, substituted or unsubstituted alkyl, alkenyl, alkynyl, aryl, heteroaryl, cycloalkyl, heterocyclic, wherein said substituents are lower alkyl, hydroxy, alkoxy, mercapto, cycloalkyl, heterocyclic, aryl, heteroaryl, aryloxy, or halogen or optionally R_1 and R_2 are linked to cooperate to form a functional cyclic moiety, and

E is $-\text{N}(\text{R}_x)_2$ or $-\text{OH}$, wherein each R_x is -H or lower alkyl.

20. The enantiomerically pure α -substituted carboxylic acid according to claim 19, wherein the carboxylic acid is an α -amino acid.

21. The enantiomerically pure α -substituted carboxylic acid according to claim 18, wherein the carboxylic acid is an α -hydroxy acid.

22. The method according to claim 1, wherein the nitrilase has an amino acid sequence as set forth in SEQ ID NO:2 or SEQ ID NO:4.

23. The method according to claim 1, wherein the nitrilase is encoded by a nucleic acid sequence as set forth in SEQ ID NO:1 or SEQ ID NO:3.

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24. The method according to claim 1, wherein the nitrilase has an amino acid sequence at least 70% identical to the amino acid sequence as set forth in SEQ ID NO:2 or SEQ ID NO:4 and has nitrilase activity.
25. A substantially purified polypeptide having an amino acid sequence as set forth in SEQ ID NO:2 or SEQ ID NO:4 and sequences having at least 70% identity thereto and having nitrilase activity.
26. An isolated nucleic acid sequence encoding an amino acid sequence as set forth in SEQ ID NO:2 or SEQ ID NO:4 and sequences having at least 70% identity thereto and having nitrilase activity, and fragments thereof that hybridize to the nucleic acid sequence.
27. An isolated nucleic acid sequence as set forth in SEQ ID NO:1.
28. An isolated nucleic acid sequence as set forth in SEQ ID NO:3.
29. A substantially purified polypeptide having an amino acid sequence as set forth in SEQ ID NO:2.
30. A substantially purified polypeptide having an amino acid sequence as set forth in SEQ ID NO:4.

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